

34 are new.

The Examiner stated that claims 4, 13-15, and 26 would be allowable if rewritten in independent form. Applicants gratefully acknowledge the Examiner's indication of allowable subject matter.

The Examiner stated that claim 11 is a duplication of claim 9. In response, Applicants have canceled claim 11.

The Examiner rejected claims 1-3, 6, 20, 21, and 23 under 35 U.S.C. §103(a) as being unpatentable over Kang *et al.*, YOR919950085US1.

The Examiner rejected claims 5 and 22 under 35 U.S.C. §103(a) as being unpatentable over Kang in view of Desai *et al.*, U.S. Patent 6281581.

The Examiner rejected claims 7-11, 16-19, 24, 25, 27, 29, and 30 under 35 U.S.C. §103(a) as being unpatentable over Desai in view of Kang.

The Examiner rejected claims 12 and 28 under 35 U.S.C. §103(a) as being unpatentable over Desai in view of Kang, as applied to claims 7-11, 16-18, 19, 24, 25, 29, and 30 above, and further in view of Sakai *et al.*, U.S. Patent 6077477.

Applicants respectfully traverse the §103(a) rejections with the following arguments.

### **35 U.S.C. §103(a)**

The Examiner rejected claims 1-3, 6, 20, 21, and 23 under 35 U.S.C. §103(a) as being unpatentable over Kang *et al.*, YOR919950085US1. The Examiner alleges that "Kang discloses a method for forming an electronic structure and inherently the structure formed by the method, the method comprising the steps of providing a substrate (solderable layer of Ni, Co, Fe...); and

soldering a lead-free solder member to the substrate without using a joining solder to effectuate the soldering, wherein the solder member comprises a tin-antimony alloy that includes predominantly Sn and about 1-10% Sb by weight (see page 4); wherein the soldering step includes inherently reflowing the solder member to make it adhere to the substrate (see page 2); wherein the substrate includes a semiconductor chip (see page 2). But it does not disclose expressly the claimed range of percentage of Sb.... However, it has been shown that in the case where the claimed ranges 'overlap or lie inside ranges disclosed by the prior art' a prima facie case of obviousness exists (see MPEP 2144.05).... Therefore, it would have been obvious to use Kang's teaching to obtain the invention as specified in claims 1-3, 6, 20, 21, and 23."

Applicant respectfully contends that claim 1 is not unpatentable over Kang, because Kang does not teach or suggest each and every feature of claim 1. For example, Kang does not teach or suggest "soldering a lead-free solder member to the substrate without using a joining solder to effectuate the soldering, wherein the solder member comprises a tin-antimony alloy that includes about 3% to about 15% antimony by weight." Kang merely discloses "lead-free solder balls selectively situated on said solderable layer." See Kang, page 4, lines 3-4. Kang does not teach or suggest that the solder balls having the required tin-antimony composition were actually "soldered" to the solderable layer, as required by claim 1 of the present invention. For example, the solder balls of Kang could have been formed by having the various solder ball materials (i.e., the materials of tin and antimony) sequentially electroplated on the solderable layer to form a tin electroplated layer and an antimony electroplated layer, followed by mixing the tin electroplated layer and the antimony electroplated layer via reflow, resulting in a solder ball having the required tin-antimony composition. Based on the preceding argument, Applicant respectfully maintains

that claim 1 is not unpatentable over Kang, and that claim 1 is in condition for allowance. Since claims 2-3 and 6 depend from claim 1, Applicants contend that claims 2-3 and 6 are likewise in condition for allowance.

Applicant respectfully contends that claim 20 is not unpatentable over Kang, because Kang does not teach or suggest each and every feature of claim 20. For example, Kang does not teach or suggest “a lead-free solder member soldered to the substrate with no joining solder between the solder member and the substrate, wherein the solder member comprises a tin-antimony alloy that includes about 3% to about 15% antimony by weight.” Kang merely discloses “lead-free solder balls selectively situated on said solderable layer.” See Kang, page 4, lines 3-4. Kang does not teach or suggest that the solder balls having the required tin-antimony composition are actually “soldered” to the solderable layer, based on the same analysis that was presented *supra* by Applicants in conjunction with claim 1. Additionally, while Kang does not disclose joining solder between the solder member and the substrate, Kang does not teach its absence. That is, Kang does not teach or suggest “no joining solder between the solder member and the substrate.” Based on the preceding arguments, Applicant respectfully maintains that claim 20 is not unpatentable over Kang, and that claim 20 is in condition for allowance. Since claims 21 and 23 depend from claim 20, Applicants contend that claims 21 and 23 are likewise in condition for allowance.

All remaining claim rejections require use of Desai (U.S. Patent 6,281,581). However, Applicants contend that Desai cannot be used as prior art in rejecting claims of the present patent application, because “[e]ffective November 29, 1999, subject matter which was prior art under former 35 U.S.C. 103 via 35 U.S.C. 102(e) is now disqualified as prior art against the claimed

invention if that subject matter and the claimed invention 'were, at the time the invention was made, owned by the same person or subject to assignment by the same person.'" MPEP 706.02(1)(1). First, the present patent was filed on February 8, 2001 which is after November 29, 1999. Second, the Desai patent is being considered by the Examiner as prior art under former 35 U.S.C. 103 via 35 U.S.C. 102(e), because the Desai patent issued on August 28, 2001 which is after the filing date of February 8, 2001 of the present patent application. Third, both the subject matter of Desai patent and the claimed invention of the present patent application were, at the time the invention was made, owned by International Business Machines Corporation or subject to assignment by International Business Machines Corporation. Accordingly, Applicant respectfully maintain that Desai cannot be used as a prior art reference. Consequently, Applicants respectfully maintain that the rejection of claims 5, 7-12, 16-19, 22, 24-25, and 27-30 is improper.

Additionally with respect to the rejection of claims 7-11, 16-19, 24-25, 27, and 29 over Desai in view of Kang, and even if the Desai reference could be used as prior art, Applicants respectfully dispute the Examiner's allegation that "[a] person of ordinary skill is motivated to modify Desai with Kang to obtain reliable relief without the harmful effect of lead. In a similar manner it would be obvious to use a modified lead-free joiner solder to substitute for the Sn-Pb in Desai." Applicants argue that at the time that the present invention was made, and even at the present time, Sn-Pb joiner solder was and still is commonly used. Desai's use of lead in both the solder bump 632 and the joiner solder 630 illustrates the point. Thus, Applicants contend that Desai cannot be combined with Kang with respect to "soldering the solder member to the second substrate with a lead-free joiner solder" in claim 7, and with respect to "wherein the solder member is soldered to the second substrate with a lead-free joiner solder" in claim 24. Based on

the preceding argument, Applicants respectfully maintain that claims 7 and 24 are not unpatentable over Desai in view of Kang and are in condition for allowance. Since claims 8-11 and 16-19 depend from claim 7, and since claims 25, 27, and 29 depend from claim 24, Applicants contend that claims 8-11, 16-19, 25, 27, and 29 are not unpatentable over Desai in view of Kang and that claims 8-11, 16-19, 25, 27, and 29 are likewise in condition for allowance.

### CONCLUSION

Based on the preceding arguments, Applicants respectfully believe that claims 1-10 and 12-34 meet the acceptance criteria for allowance and therefore request favorable action. If the Examiner believes that anything further would be helpful to place the application in better condition for allowance, Applicants invite the Examiner to contact Applicants' representative at the telephone number listed below.

Date: \_\_\_\_\_

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Schmeiser, Olsen & Watts  
3 Lear Jet Lane  
Latham, New York 12110  
(518) 220-1850

Jack P. Friedman

Jack P. Friedman  
Registration No. 44,688